

A New Search for *Hyphaene guineensis* Thonn.

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Synopsis

Hyphaene guineensis Thonn. was described by Thonning himself who had visited the lower regions of Ghana towards the end of the 18th century, but the species was published posthumously in 1829, over twenty years after the destruction of the type in the Copenhagen Herbarium during a bombardment of the city by a gunboat. Since then no duplicates have been located and a great deal of confusion had arisen over the precise identity of the species. Sometimes it has been regarded only an infra-equatorial species of West Africa, the fact being overlooked that the type was from the supra-equatorial region. However, those who attribute it to the latter region, have identified it with different montane species, as if none is found in the lower regions.

The account of a German expedition effected along the west coast of Africa in 1873–76 shows that a single, unbranched stemmed species, identified by them as *H. guineensis*, was quite common on the coastal lands from the Cape Palmas eastward to Ghana and Nigeria and southwards as far as Angola. Attempts were therefore made to locate specimens in the herbaria of the coastal states of supra-equatorial regions and to obtain nuts from living trees. No specimens were available of any coastal species and botanists did not seem to have seen any species in the coastal region. But the Keeper of the Herbarium of the University of Ghana and his associates visited the places on the coast near Accra and on the banks of the Lower Volta (regions apparently studied by Thonning) and obtained specimens which represent some forms of *H. guineensis*.

This induced me to study the specimens in the Kew Herbarium collected in Upper Guinea. They could not be located previously when a search was made during my earlier attempt to identify the species in Lisbon. The result of my study shows that this species varies a great deal in Ghana, probably because of the ocean winds (referred to also by the German explorers of 1873–76). Some forms agree precisely with what I had described earlier as *H. doreyi* from Angola but others are quite different. However, a specimen from the Kew Herbarium, collected in Ghana in 1886 and labelled as *H. thebaica*, has been chosen as the neotopotype of *H. guineensis* because it agrees most closely with the original description of the species. The wide distribution of the species is explained on the assumption that the species has originated in Angola and subsequently spread to the north through the Benguela Ocean currents.

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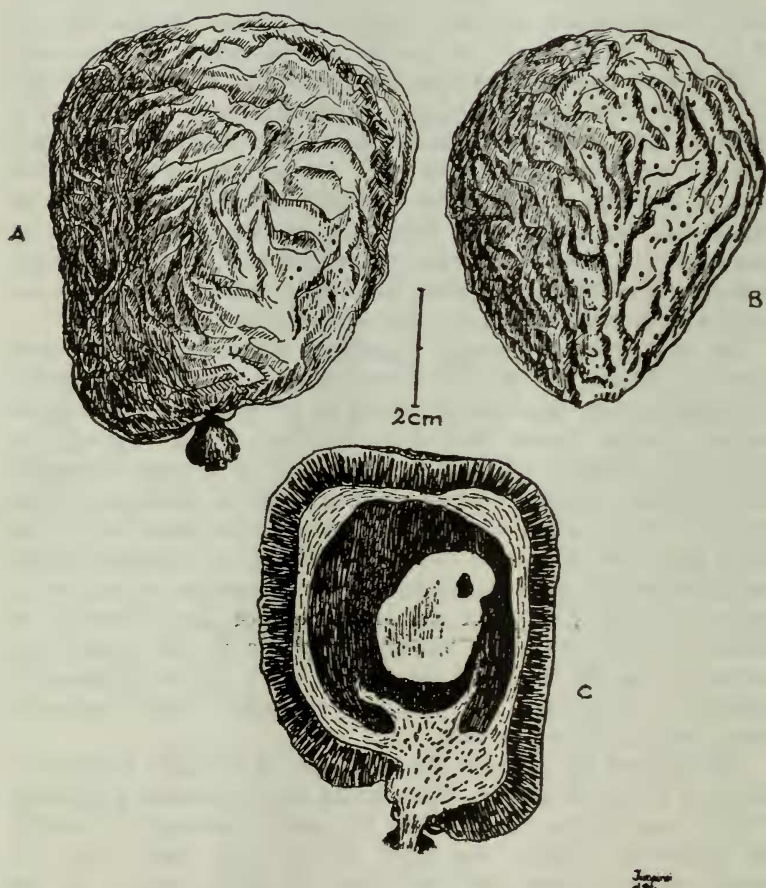


Fig. 1. *Hyphaene baikieana* Furtado (Holotypus — K).

A: Fructus latere visus. B: Aspectus ejusdem vertice visus. C: Sectio ejusdem verticalis.

The Kew specimens also revealed the misleading nature of figures of *H. macrosperma* in Beccari's *Borasseae* (1924). As a result, the three forms which I had referred to *H. crinita* have been separated as ***H. crinita* Gaertn.**, ***H. baikieana* Furtado sp. nov.** and ***H. togoensis* Becc.** Other species confused with *H. guineensis* are ***H. macrosperma* Wendl.** (*H. dahomeensis* Becc.) and ***H. tuleyana* Furtado sp. nov.** The last is apparently the same taxon which Drude had identified as *H. thebaica* and which Tomlinson had referred together with *H. togoensis* to *H. guineensis*. Since *H. thebaica* has been widely confused, three forms of this species have been illustrated.

Probable Origin of Confusion

One of the most misapplied binomials of the genus *Hyphaene* is *H. thebaica* (L.) Mart.; it seems to be a handy name to indicate any branched species of *Hyphaene* that one is not able to identify with certainty, be it a native of northern Egypt, the western coast of India, or from anywhere in Arabia, Madagascar, Kenya, Mozambique, Angola, Upper Guinea or found cultivated in any of the Gardens of Asia or America. A recent case of such misapplication is by Menninger (*Fantastic Trees*: 72 (1967)) who has given under that name photographs of a palm that obviously belongs to the group of *H. baronii* Becc. if not identical with it.

When this practice is adopted in authoritative Floras without attempts being made to distinguish any peculiar systematic forms found in the region dealt with from those growing outside that region, students of the genus get generally discouraged. This may be one of the main reasons for the confusion that exists in the nomenclature of the species of the genus.

In my own case, though I had pertinent Floras, Check-Lists, many journals and popular books, I soon found myself confronted with so many contradictions and equivocal use of binomials that I had to give up my intention of making myself familiar with the genus *Hyphaene* and of determining its few specimens that were available in the herbaria in Lisbon. It was only when a copy of Beccari's revision of *Hyphaenes* (*Borasseae*, 1924) was obtained that I was able to carry out my undertaking.

Thus *H. guineensis*, to quote an example that concerns this paper, was credited to Upper Guinea in the region of the Niger by Drude, (Engl. Jahrb. 21: 110 & 123 footnote 3, (1895)) who based his conclusion on Pechuel-Loesche's report on *Die Loango Expedition*, 1882, (quoted here below) and on the specimen from Dr. Baikie's Niger Expedition which has been described here as *H. baikieana*. Drude, who wished to adopt *H. congensis* Kirk nom. nud. in Salomon's list of palms (1887) for the taxon in Lower Guinea, overlooked the fact that *H. guineensis* identified by Pechuel-Loesche was an unbranched coastal palm. Rendle (*Cat. Welw.* 2: 82 (1899)) re-adopted *H. guineensis* for an Angolan palm, while Wright (*Fl. Trop. Africa* 8: 120 (1901)) recorded the

species as though from Lower Guinea only. But Hutchinson (Hutch. & Dalziel, *Fl. W. Trop. Afr.* 2: 132 (1936)) treated the species as if of Upper Guinea only (i.e. Ghana, Togoland and the neighbouring regions) and made no remarks about other senses given to the same binomial, nor did he state whether there was any reason to accept or reject the species as interpreted by Rendle, Wright and others, or even by Beccari. Irvine, who had worked for a number of years as a professor of biology in the Gold Coast Colony (now the independent state of Ghana), credited only one species to the country, the one that produced a branched stem; he called it *H. thebaica* and remarked that it was not an uncommon species in the drier regions of Ghana and Togoland (*Plants from Gold Coast*: 235 (1930)). Later he recorded the same species also from Nigeria and Sierra Leone (*West African Botany* 1931: 176 & 188 (1941, reprint)). In 1961 (*Woody Plants of Ghana*: 780–781 pl. 34a) Irvine followed the practice of Wright, Hutchinson and others, and so extended the distribution of *H. thebaica* also to Tanganyika, Somaliland and Arabia. Obviously he did not agree with or consult Beccari (1924). The latter had restricted the use of the binomial to a taxon native only of the Sudan and Egypt, had adopted *H. togoensis*, *H. dahomeensis* and *H. macrosperma* (with *H. guineensis* as yet doubtful) for the species from the supra-equatorial region of tropical West Africa, and other names for the species of other regions of North and East Africa and India.

In an authoritative Flora like that of Hutchinson and Dalziel (1936) one expects that the authors would accept or reject with justification the previous interpretations by Irvine and others of *H. thebaica* as found in Ghana and the neighbouring countries and from which Beccari had excluded the three or four species mentioned above. Hutchinson, however, followed an unusual procedure. He did not credit *H. thebaica* to Ghana and the neighbouring regions; instead of identifying the species discussed by Beccari and Irvine, he exonerated himself on the plea that he had not seen from the region any authentic specimens of these taxa. So he merely listed *H. guineensis*, *H. togoensis* and *H. dahomeensis* and, despite greater systematic differences recorded by Beccari between the last two, he expressed his suspicion that the last two were probably only synonyms of the first! For some unknown reason Hutchinson ignored *H. macrosperma* Wendl. founded on a specimen collected by Baikie apparently during his Niger Expedition. He referred the reader to the *Appendix* of the *Flora* which had probably been already prepared although issued only in 1937 (and reprinted also in 1955). In this *Appendix*, Dalziel, its compiler, disregarded Hutchinson's opinion and quoted the vernacular names of all Hyphaene species including that of *H. guineensis* from the region under *H. thebaica* as if he regarded merely as synonyms the different species recorded by Beccari from Upper Guinea and North Africa. Dalziel's statement that Hyphaene is a monoecious palm is probably a misprint for dioecious. (As to the word *Sokuti* quoted by Dalziel, it can



Fig. 2. *Hyphaene crinita* Gaertner

Three views of the type fruit preserved in Gaertner's Herbarium at the University of Tuebingen, Germany.

apparently be applied to any palm tree in the Ewe language of Ghana, for according to information obtained by Dr. Hossain, *Soku* means a "palm fruit" and *Sokuti* a "palm tree").

Yet Beccari, Irvine and even Hutchinson and Dalziel were contemporaries who were dealing with the objects seen growing in the regions. Excepting the types of *H. guineensis* which are lost, specimens in herbaria could have been consulted. Beccari not only had described the different species but also given illustrations of the fruits (mostly types) for the guidance of systematists. Under these circumstances failure of making a systematic survey of the species recorded from Ghana and the neighbouring countries on the plea that no authentic specimens were seen constitutes a lacuna that is hardly excusable in a Flora that claims to be authoritative. Besides, Kew Herbarium had some specimens from Ghana and the neighbouring regions.

Tomlinson, interested in the anatomy of palms, and while attached at one stage to the University of Ghana, noticed only one *Hyphaene* species indigenous in Ghana and Nigeria, the same that for fifty years or more previously was mistaken for *H. thebaica*. As the types of *H. guineensis* were collected in Ghana more than 150 years earlier and only one species had definitely been recorded since that time from the territory, Tomlinson felt justified in adopting the binomial *H. guineensis* for the only Ghanaian species known to him, and, according to him, this taxon was wholly different from the true *H. thebaica* from Egypt (*Anat. Mon. II. Palmae*, 158 (1961))* . Besides, in the absence of the types and any other specimen from the type region, Thonning's data of *H. guineensis* were, until recently, considered too inadequate to identify the species precisely. The procedure adopted by Tomlinson seemed then to be the most logical, for it did not leave the Ghanaian species unnamed, nor did it permit either of the two binomials i.e. *H. guineensis* and *H. thebaica* to be used equivocally for the same species of West Tropical Africa, nor *H. guineensis* to be excluded from Ghana where the type of the species was collected.

However, in the second edition of the *Flora of W. Trop. Africa* 3: 169 (1968), Russell stressed that lack of adequate herbarium material was the reason for disregarding both Beccari's and Hutchinson's treatment of the different species from West Tropical Africa and for following Dalziel in adopting for all of them the name *H. thebaica*. Russell seems to have some doubt as to *H. guineensis* Thonn. being from Upper Guinea. He was probably unaware that Thonning himself had collected the type of his species in a former Danish settlement in Ghana, and not in Lower Guinea as Wright (*Fl. Trop. Afr.* 8: 121 (1901)) had erroneously recorded.

Now, Beccari had received from several parts of the Gulf of Guinea fruits which were not identical with *H. togoensis*. Further,

* In comparing the anatomy of the leaves Tomlinson mistook *H. sinaitica* from Israel for *H. thebaica* — q.v.

H. togoensis was a palm that normally branched dichotomously while *H. guineensis* is taken to be a palm that normally does not branch, a reason why Beccari placed it in his Section *Ventricosae*.

Beccari (1924) who had vast experience with the genus *Hyphaene* was of the opinion that its species produced very localized forms. This led him to believe that the taxon identified as *H. guineensis* from Lower Guinea by Rendle, Wright and others could not be the species so named from Upper Guinea. This was also the opinion of Drude (1895) who wished to distinguish the species from Lower Guinea as *H. congensis*. As the Angolan species did not produce a ventricose stem and had moreover thickly lepidote leaves, it could not belong to the *Ventricosae* of Beccari. In addition, the Angolan fruits, being capitate and somewhat constricted below the apex, could not be described as sub-rounded turbinate (turbinato-subrotunda) as noted in the protologue of *H. guineensis*. *H. congensis* was a *nomen nudum*. The species was therefore named *H. doreyi* by me in honour of the collector who had procured for me a most complete specimen of the species and also many details of the plant's early and later growth. Besides this, there were from the same region two more species which obviously did not belong to the *Ventricosae*.

I was also fortunate enough to receive from Tomlinson specimens from Ghana and so was able to verify that what he had named as *H. guineensis* was identical with *H. togoensis*. In view of this I included *H. guineensis* sec. Tomlinson and *H. togoensis* Becc. in the synonymy of *H. crinita* Gaertn. as newly typified by me but excluded from it *H. dahomeensis* and *H. macrosperma* (Furtado in *Rev. Garcia de Orta* 15, 1967: 449 & 459 (1970)).

A Search for Literature

When I was trying to determine the origin of a specimen in a Lisbon herbarium, a British systematist, who had widely explored the regions along the Niger and the neighbouring countries, informed me that *Hyphaene* spp. are never found in low, humid regions, and that in Ghana, Nigeria, etc. they are found only in the upper reaches of the river Niger where it passes through arid country. He therefore rejected my suggestion that the specimen in question could have been from any of the collectors who had visited only the lower regions of the Congo, Nigeria, Ghana or any of the islands in the Gulf of Guinea i.e. the collectors who could have sent the specimen to Lisbon.

This surprised me indeed, for most *Hyphaene* specimens with which I was acquainted in the Lisbon Herbaria were from the lower regions, often from the sea-coast of Mozambique, Angola and the Congo, and Drude (*Engl. Jahrb.* 21: 123 (1895)) had recorded at least one species from the coastal region of Loango. Consulting again Schumacher's account (*Kong. Danske Vidensk. Selsk. Nat. Math.* 3: 25–26 (1828)) of Thonning's exploration, it became obvious that the latter had botanized generally in the low regions around Accra and other places as far east as the

Lower Volta i.e. in the territory that constituted the then Danish Guinea. Now, Tomlinson's field notes on the specimens he presented to me state that the species he had recorded for Ghana was from the higher regions only and was common in North Nigeria. This was also true according to Irvine (1930 & 1961) who had identified it as *H. thebaica*. It was evident therefore that *H. guineensis* sec. Tomlinson could not be Thonning's species, though it was the same as Irvine's *H. thebaica*.

Chipp's *A List of Trees, Shrubs and Climbers of the Gold Coast* (1913) and *The Gold Coast Forest: A Study in Synecology* (1927), did not list any *Hyphaene* species from Ghana though the latter work recorded the results of careful sample surveys of a large area of Lower Ghana. However, an inquiry into the account of *Die Loango Expedition 1873-1876* made under the patronage of Die Deutschen Gesellschaft Zur Erforschung Aequatorial-Africas, published in three parts 1879-1882 & 1907, furnished very interesting data. Guessfeldt (Abth 1: 46 (1879)) stated that *H. guineensis* occurred either isolated or more frequently singly in open groves in narrow strips of sandy ground parallel to the sea-coast. The frontispiece plate, drawn by one of the artists of the Expedition, shows palms with separate, non-cespitose and unbranched stems, few with two stems growing together. Apparently this is the same species which Smith had identified from its outward appearance as a *Hyphaene* species, but Brown thought that this was a species of *Corypha* (= *Borassus*) because the branching of the stem was not mentioned, overlooking the fact that Smith had already identified another fan-leaved species as *Corypha* (Tuckey, Exped. Zaire App. 5, 456-457 (1818)). If all *Hyphaene* species were taken to produce branched stems as Brown and others then considered, it need not be stressed when naming the genus, even though a species would fail to bifurcate occasionally.

Unfortunately Wright (1901) consulted only a drawing of the palm on the frontispiece of the first part of Guessfeldt (1879) who had observed the palm in Cabinda on the Loango Coast, north of the River Congo (Zaire). But in the first half of the third part of the Report (1882), Pechuel-Loesche mentions the occurrence of "this erect (unbranched), sea-loving, fan-leaved, forest-shy" non-cespitose palm, either alone or in open rows, or in extensive groves on sandy places along the sea-coast from the eastern part of Liberia near Cape Palmas eastwards to the Ivory and the Gold Coasts, and the Niger delta and southwards to Angola a little south of 7° L.S., near Ambrizette. Further south a repeatedly divided species identified as *H. coriacea** and *H. benguellensis* are reported to occur.

The maritime species of the north as well as of the south was identified as *H. guineensis* because it bore an undivided, solitary stem, and because it grew along the sea-coast. According to Pechuel-Loesche, humid winds seem to make the Ivory and the Gold Coasts less favourable to vegetation and apparently also to *H. guineensis* which was less common here than on the western

* *H. coriacea* is native of East Africa.

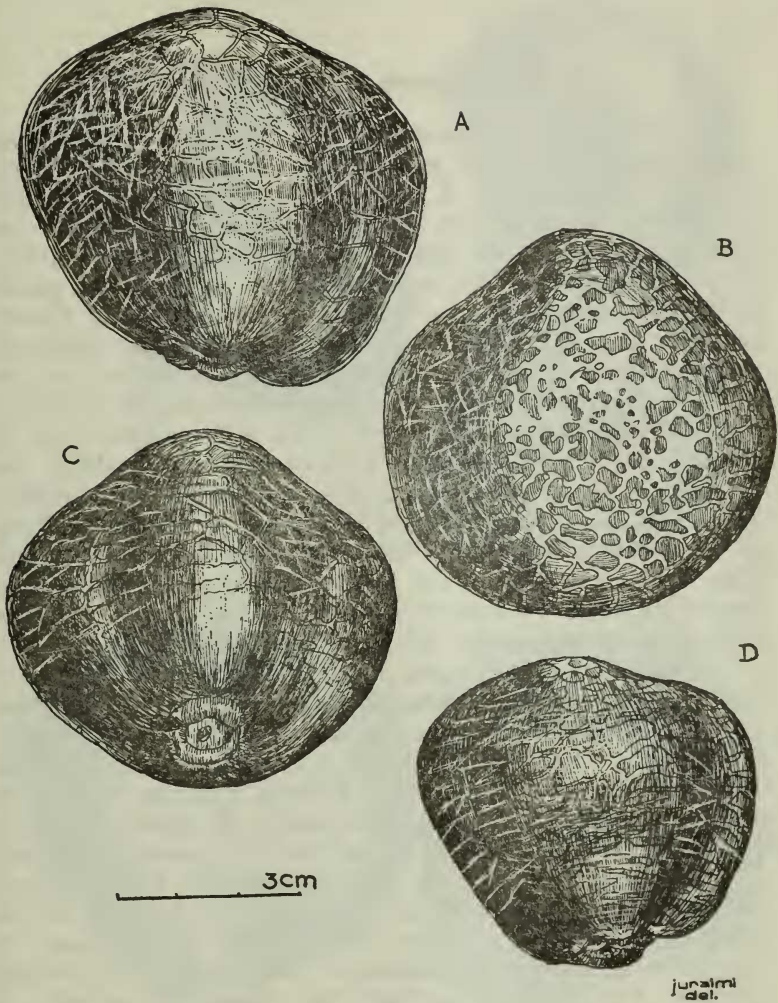


Fig. 3. *Hyphaene guineensis* Thonn. (Neotopotypus — K)

A and D: duo fructus similiformes sed magnitudine dispares. B: Apex fructus vertice visus. C: Aspectus ejusdem ab imo magis versus carinam.

side of Cape Palmas. However, he could not determine whether this sparseness of the palm was due to natural influence or to human interference as the places wherein this *Hyphaene* should have thrived were utilized by the local villagers to grow coconuts. Elsewhere in the east both coconuts and *H. guineensis* were found growing together.

A New Search for the Palms

From the observations made by Mr. J. D. Sampayo d'Orey in whose honour *H. doreyi* was named, the palm remains stemless even for a number of years, and the same fact has been recorded by Welwitsch (on herbarium labels of specimens not definitely associated with any fruits) who stated that vast tracts might be noticed along the sea-coast covered with stemless palms which from time to time grow tall individually and produce flowers and fruits. If such a phenomenon occurred also in Ghana, botanical collectors would generally have ignored the plants. Further, modern botanical explorers in Upper Guinea seemed to hold the view that the species of *Hyphaene* grow only in the higher regions. But, as we have seen from Schumacher's information quoted above, the holotype of *H. guineensis* must have come from the lowlands. This and the remarks of Pechuel-Loesche that an unbranched form of *H. guineensis* was widely distributed along the sea-coast from Cape Palmas eastwards to the Gulf of Guinea and southwards to Angola suggested the need of exploring the low regions of Upper Guinea for an unbranched species of *Hyphaene*.

Accordingly, I wrote to several institutions in Liberia, the Ivory Coast, Ghana and the neighbouring regions, to see if any species of *Hyphaene* could be located in the lowlands especially along the sea-coast. Unfortunately, the institutions that replied had no specimens of such a palm in their herbaria, nor were they aware of the existence of any living specimens in the region. The Herbarium of the University of Ghana had no specimens, but Mr. L. M. Quartey, Curator of the University Gardens, Legon, Ghana, and Dr. M. Hossain, Botanist at the University and Curator of the University Herbarium, together obtained for me specimens of "*Hyphaene guineensis* sec Tomlinson" cultivated at the University Gardens. They informed me that these plants were probably a progeny of the plants so labelled at the Achimota School Arboretum. Obviously these were the plants which Irvine had identified as *H. thebaica* in his books, but the change in nomenclature was made by Tomlinson* long after Irvine's retirement from the Achimota School.

Since this plant did not represent a species of the lowlands, both Dr. Hossain and Mr. Quartey were encouraged to visit some of the possible sites where Thonning might have found his *H. guineensis*. They were successful in locating unbranched *Hyphaene*

* On a specimen he sent me from the Achimota School Gardens, Tomlinson remarked: "Apparently introduced but wild in North Nigeria."

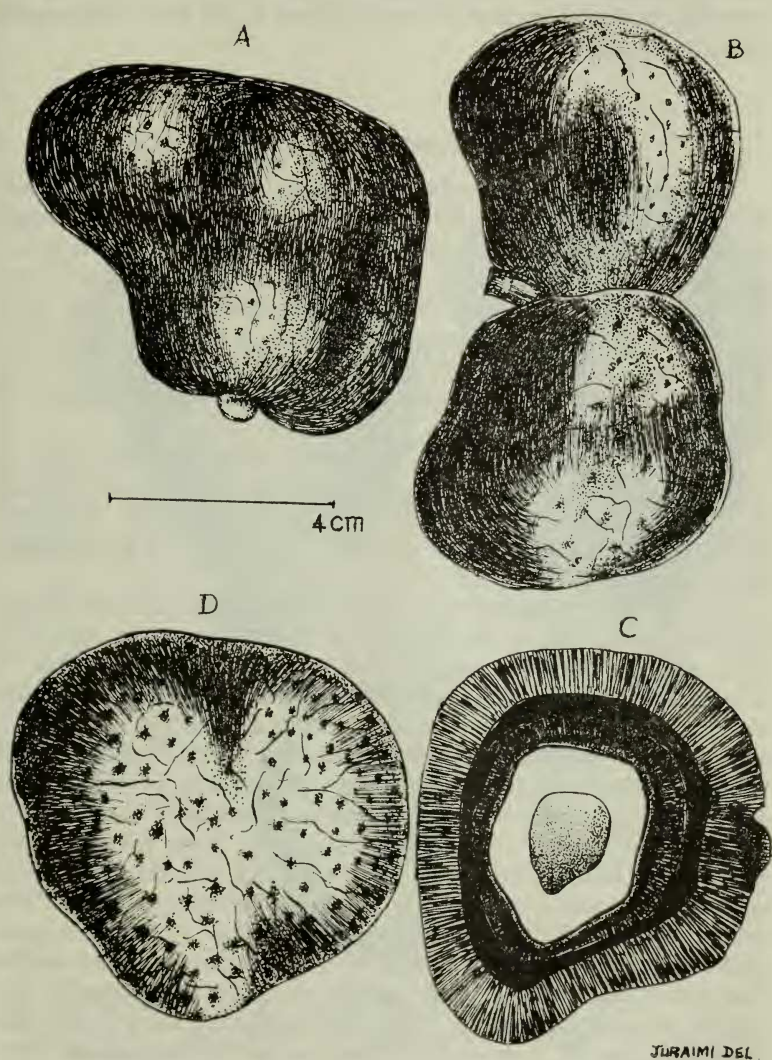


Fig. 4. *Hyphaene guineensis* Thonn. (Ayittey GC. 37,579) (forma *H. doreyi*)
 A: Fructus. B: Fructus geminatus. C: Sectio fructus verticalis. D:
 Aspectus ejusdem vertice visus.

palms along the sea-coast near Accra and along the Lower Volta region. The fruits varied a great deal but there is no doubt that the specimens represented *H. doreyi*. Geographically this could be readily accepted as Thonning's *H. guineensis*, but as there were important differences in the fruit, a further inquiry was necessary. Elderly people of the locality informed Dr. Hossain that the palm generally grows along the sea-coast though it has now disappeared from many places.

Thonning's Description of the Fruit

Thonning gave an extensive description of the leaves and male flowers. He did not see the female flowers, and gave a meagre description of the fruit. From the fact that he did not mention that the stem was branched or cespitose, it can be inferred that the palm was solitary and had an unbranched stem. The most important part of the long description is "*drupa turbinato-subrotunda, obtusissima, obsolete trigona*" which may be translated as follows: "fruit turbinate sub-rounded, very obtuse at the top, obsoletely trigonous."

Wendland (Bot. Zeit. 39: 92 (1881)) described the fruit as "obliquely depressed, obovate, flattened at the vertex, rounded or obtusely trigonous, 6 cm tall, 60 × 65 mm in diam. The seed obliquely roundish, hardly 3 cm high, 37–40 mm in diam. From West Coast of Central Africa."

The fact that Wendland was a keen collector of palm fruits and that his description of the fruit of *H. guineensis* agrees well with that given by Thonning suggest that he might have had access to one of the isotypes distributed by Thonning to several botanists in Europe. Moreover Wendland gave the dimensions of the fruit and the seed and stated that the fruit came from "West Coast of Central Africa", particulars he could not have known except from herbarium specimens because no one had mentioned them before. In fact subsequent workers on the species have ignored these particulars. Neither Thonning nor Wendland described the fruits as being abruptly capitate and somewhat constricted below the apex or in the middle, characteristics of *H. doreyi* both in Angola and in Ghana. However it has to be recalled that Pechuel-Loesche mentioned that the sea winds seemed to affect unfavourably the growth of vegetation in the Ivory and the Gold Coasts in general, including also *H. guineensis*. Variations in the fruit could have been one of the responses, or else there could be another lowland species in Ghana. Hence Dr. Hossain and his associate were requested to make a further survey of the areas, while all the specimens preserved in the Kew Herbarium from Upper Guinea were obtained on loan for study.

The subsequent explorations in Ghana were restricted to the previous localities in former Danish Guinea where Thonning was a Danish official; the newer specimens were again more akin to those from Angola. However the Kew Herbarium has from an indefinite place in Ghana fruits which, though representing *H.*

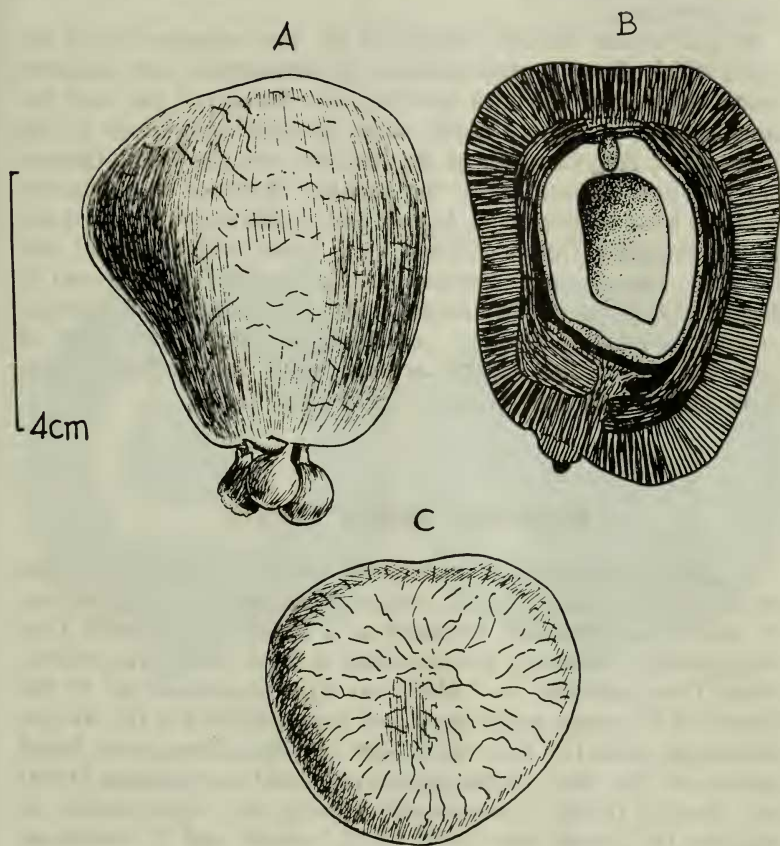


Fig. 5. *Hyphaene guineensis* Thonn. (leg. Hossain GC. 37,578).

A: Fructus latere visus. B: Sectio ejusdem verticalis. C: Aspectus ejusdem vertice visus.

doreyi, agree generally with Thonning's and Wendland's descriptions of *H. guineensis*. Since the fruits have a dark brown epidermis which cracked in the parts exposed to the sun ("cortice fragili" according to Thonning), there is no doubt that the specimen is from the lowland, and the name *H. thebaica* given in the Herbarium is a misnomer, for the latter species grows on highlands and produces fruits with yellowish brown epidermis which does not crack even on drying. Hence the specimen in the Kew Herbarium is chosen as the neotype of *H. guineensis* with *H. doreyi* as a synonym.

As said above, Beccari, relying on his vast experience with the genus which shows a great tendency to differentiate into localized forms, discounted the idea that the distribution of one and the same species or variety could occur in such wide areas as the sea-coast of Angola south of the equator near the River Quanza and in Upper Guinea above the equator. However *H. guineensis* seems to have originated in Angola and is distributed to the north by the Benguela Ocean currents — a factor which Beccari had not taken into account. Another peculiarity generally observed in Angola but so far not in Ghana is that the species form stemless colonies as mentioned above, sometimes occupying vast tracts of land. But, after some months or even years, the specimens grow stems individually and produce flowers and fruits.

***Hyphaene crinita* Gaertn.**

In trying to identify *H. guineensis* Thonn. I stumbled on the problem of the identity of *H. crinita* rather unexpectedly, because *H. crinita* was generally regarded as a species from South East Africa and *H. guineensis* was described as from North West Africa. When I was working in Lisbon, my first conclusions as to the identity of *H. crinita* were drawn and later published in the *Review Garcia de Orta* (15 (4), 1967: 449 (1970)). These were based entirely on the study of the figures published by Gaertner (1891) and Beccari (1924). Subsequently I have had opportunities to examine the actual type fruits of *H. crinita* and *H. baikieana* Furtado (= *H. macrosperma* sec Becc.), and good fruits of *H. togoensis* from the palms cultivated in Ghana. As a result I found that the figures of *H. macrosperma* sec Becc. are partly misleading and that these taxa had better be kept separate.

The probable reasons why Martius was misled to confuse *H. crinita* with *H. natalensis* are given in a paper on the identity of the latter species, published in this Bulletin (pp 283–287). However, it is often overlooked that the Dutch had a "factory" (comptoir) in Ghana and also some plantations, so that nuts from this region could have easily found a place in the seed collection of the Botanic Garden at Amsterdam where the type fruit of *H. crinita* was found. It is true that Lawson and Price (Bot. Journ. Linn. Soc. Lond. 62 (3): 321 (1969)) have ignored this fact and quoted Junghans to show that the former Danish Guinea is the

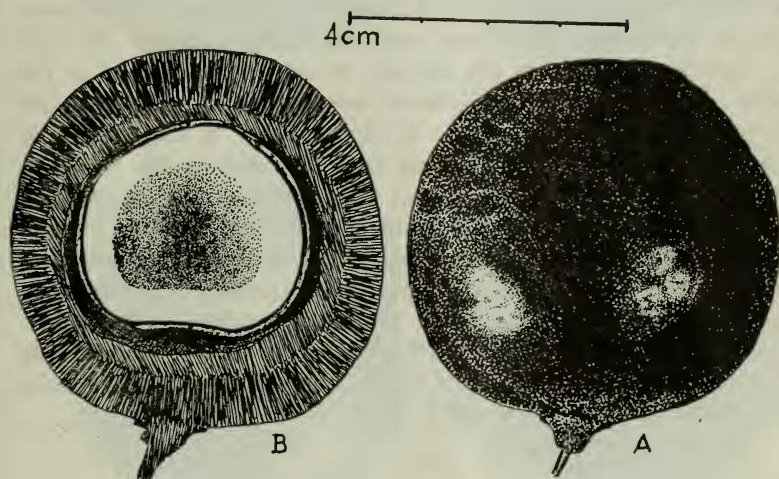


Fig. 6. *Hyphaene macrosperma* Wendl. (ex Beccari t. 18 figs. 7 and 7¹).
 A: Entire fruit; B: Longitudinal section.

area represented by Ghana. But Jeppesen (Danish Plantations on the Gold Coast in Geogr. Tidskrift 65: 73–88 (1966) shows that the Danes had only small plantations and defence posts dotted in the eastern parts of Ghana especially towards the Lower Delta, and Lasegue (Musee Bot. Delessert: 70 (1845)) notes that Palisot de Beauvais from Lisbon had reached Chamah, a Dutch “factory” (comptoir) on the Gold Coast lying between the Cape of Three Points and Cape Corse (modern Cape Coast) and thence to Koto, a Danish “comptoir” on the same coast on the River Volta. Therefore the type of *H. crinita* in Amsterdam could have been sent from Ghana by a Dutch planter.

The fact that *H. crinita* is closely allied to *H. togoensis* and *H. baikieana*, both of which are based on the types collected in Upper Guinea supports the view that the type of *H. crinita* had also come from that region. All three species have fruits which are broad at the apex and narrowed at the base and which are slightly longer than broad. The fruits of *H. crinita* and *H. baikieana* are on the dorsal side almost vertically straight though the base is slightly rotundate in the former, broad and cordulate in the latter. In *H. togoensis* the fruit is dorsally convex. The broadest diameter is below the middle in this species, in the middle or slightly above in *H. crinita*, and near the apex in the third. In both *H. crinita* and *H. baikieana* fruits are laterally compressed so that it appears somewhat triangular in cross-section. Though the available fruit specimens of *H. baikieana* have only embryonic seed, that of *H. crinita* is half-developed (known only from one fruit), and those of *H. togoensis* are fully developed. The distinctions shown above seem to justify recognition of the three taxa as distinct species. On the other hand, none of these three species are allied either to *H. thebaica* or to *H. natalensis*.

The Species form Upper Guinea

Since *H. guineensis* has been definitely identified, advantage is taken here to enumerate the species that have been found in the region and to give their synonyms.

1. *Hyphaene baikieana* Furtado *spec. nov*

H. crinita sec. Furtado in Rev. Garcia Hort. 15, 1967: 449 Ic. 2 fig. A tantum (1970) quoad synonymum *H. macrosperma* sec. Becc. p.p. **Figure 1.**

H. guineensis sec. Drude in Engl. Jahrb. 21: 124 (1895) in nota.

H. macrosperma sec. Drude op. cit.: 123; Becc., Borass: 27 t. 19 fig. 6 (1924) p.p.

H. crinita valde affinis, sed fructibus bilateraliter compressis, in sectione transversa trigonoideis, supra stigma abrupte ventricosus, dorso gibbosis, apice oblique truncatis haec species sat distincta.

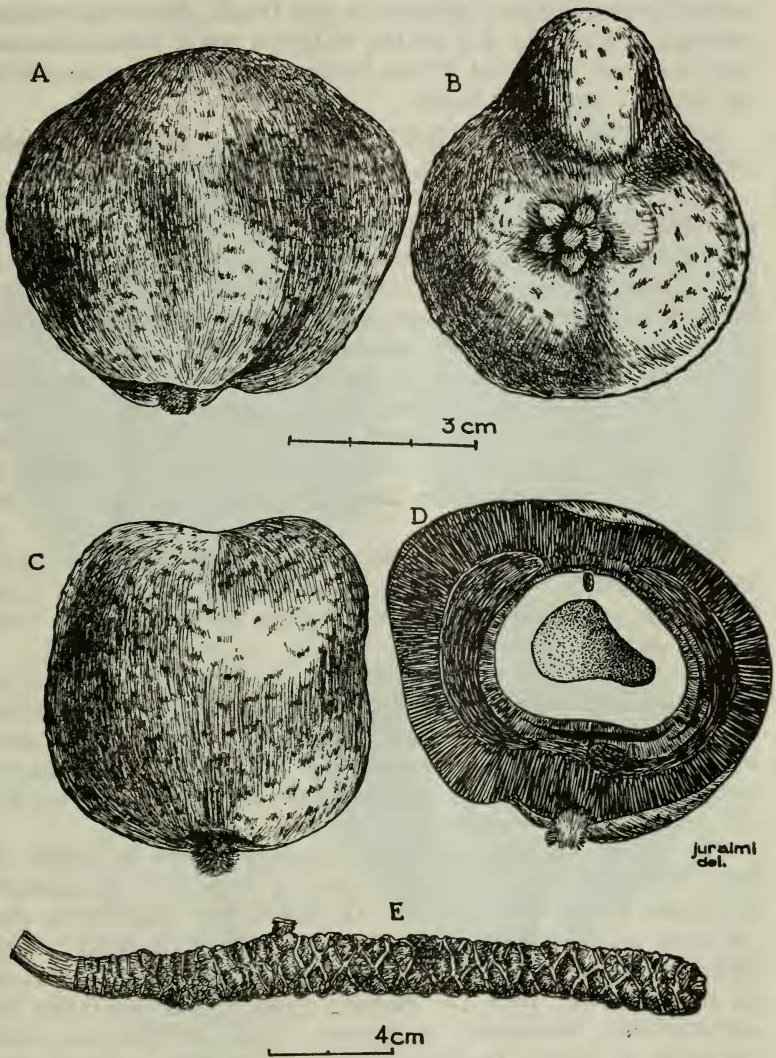


Fig. 7. *Hyphaene tuleyana* Furtado (Holotypus — K).

A: Fructus latere visus. B: Aspectus ejusdem ab imo. C: Aspectus ejusdem dorsalis. D: Fructus verticaliter sectus ut partis interiores et earum dispositio appareant.

Fructus omnes immaturi visi, unusquisque cum semine vix evoluto, ambitu obovato pyriformes, ex dorso latiores ventrem versus angustati, autem lateraliter compressi, dorso ad basin gibbosi vel sub-cordulati et ad apicem rotundati, ventre supra stigma abrupte carinati, vertice oblique truncati, centro depressiusculi, ad apicem carinae altiores, epidermide non fragili, flavescente minute punctato, 7–8 cm alti, 5–6 cm lati, 4–4.5 cm crassi. *Infructescentiae* rami duo visi, usque ad 15 cm longi, uterque amenta tres, 8–11 cm longa, 1 cm diam. ferens.

AFRICA BOREO-OCCIDENTALIS: Regio ad Fluvium Niger (Baikie leg. circa 1859 — K, **holotypus**).

Since this specimen belonged to "Dr. Baikie's Niger Expedition", both Drude and Beccari separately mistook it to be the type of *H. macrosperma*, a species described to have an "ovate" fruit as in *H. thebaica* but rounder in cross-section, and not obovate-pyriform and triangular. Geographical considerations misled Drude to identify this species as *H. guineensis*.

The peculiar facets shown in the entire fruits photographed by Martelli for illustrating Beccari's monograph are somewhat misleading and the fruit represented in Furtado figure 1, B, (copied from Beccari) is not found in the collection at Kew, though it is the one that had made me identify Beccari's *H. macrosperma* with *H. crinita*.

Because the fruit is yellow and ventricose and shows no cracks in the epidermis, I surmise that, like *H. crinita*, this species is an inland one and of higher and drier regions and that it has a stem that branches dichotomously.

The specimen was originally named as "*Hyphaene macrocarpa* Wendl.?" but later named by Martelli as "*H. macrosperma* Wendl." on grounds that it is so named by Beccari in his manuscript on "Borasseae". Wendland did not describe any species called *H. macrocarpa* and so this might have been an error for "*H. macrosperma* Wendl.?"

The holotype is indicated as if it was collected by Barter in Jan. 1860. However, Barter had died in July 1859 (Hutchinson & Dalziel, Fl. W. Trop. Afr. 1: 71 (1927)). The specimen is also indicated as being from "Dr. Baikie's Niger Expedition", with which Barter seems to have been associated only in 1857, though all the collections from Dr. Baikie's Niger Expedition (1854–59) are attributed erroneously to Barter. I have therefore not cited the name of Barter. Further, the date "Jan. 1860" seems to be the date when the specimens were received at Kew or when they were sorted out and incorporated into the Kew Herbarium. A duplicate of this specimen was donated to Drude in Berlin and was similarly labelled (op. cit. p. 124 footnote).

2. ***Hyphaene crinita*** Gaertn., Fruct. 2: 13 t. 82 fig. 4 (1791); Mart. Palm. 3 ed 2: 225 (1949) pro parte typica; Becc. in Agric. Col. 2: 157 (1908) 157 p.p. Borasseae: 29 fig. 13 (1924); Furtado in Rev. Garcia de Orta 15 (4), 1967: 449 t. Ic. 2 excl. A & B, excl. syn. et addenda: 459 t. 19 fig. infra (**holotypus**) (1970). **Figure 2.**

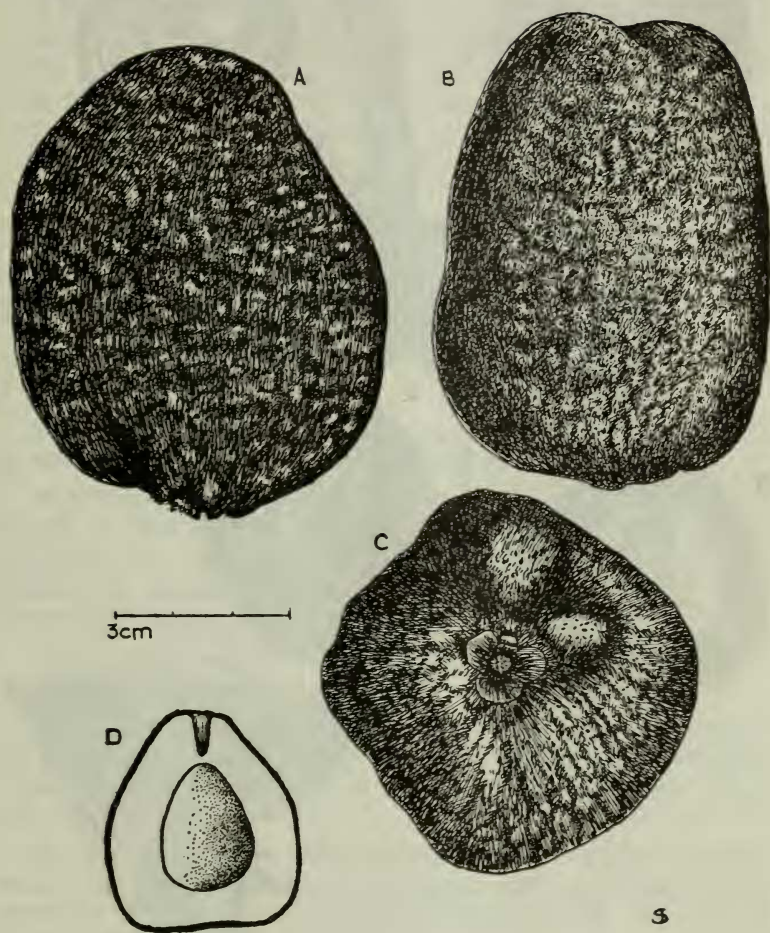


Fig. 8. *Hyphaene thebaica* (Ethiopia — K).

A: Lateral view of the fruit. B: Its dorsal views. C: The basal view.
D: Nut vertically dissected.

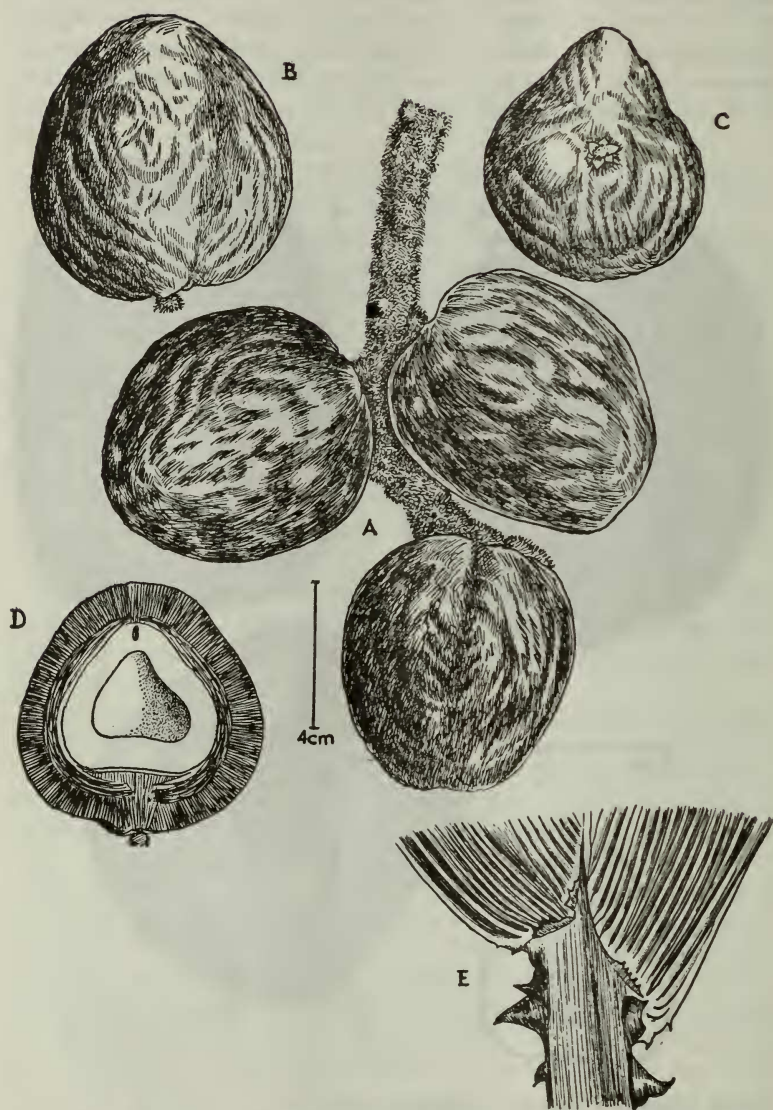


Fig. 9. *Hyphaene thebaica* (cult. University Garden, Cairo, Egypt, leg. Dr. Vivi Tackholm).

A: Fruiting spikelet with the topmost fruit as seen dorsally. *B*: Fruit as seen laterally. *C*: The basal view of the fruit. *D*: Vertical section of the fruit. *E*: Hastula.

H. thebaica sec Mart., Palm. 3: 227 (1839) quoad synonym *H. crinita* Hutch. & Dalz., Fl. W. Trop. Afr. 2: Appendix: 507 (1955) p.p.

AFRICA: **Holotypus** in Herb. University of Tübingen, Germany.

3. ***Hyphaene guineensis*** Thonn. apud Schum. in Kong. Dansk. Vid. Natur. Math. Afhand. 4: 219 (1829); Guessfeldt, Die Loango Exped. 1873–76, Abt. 1:46 (1879) & Titelbild; Wendl. in Bot. Zeit. 39: 92 (1881); Pechuel-Loesche, Die Loango Exped. Abt. 3 (1): 76 & 121 (1882); Drude in Engl. Jahrb. 21: 110 & 123 (1895) p.p.; Rendle, Cat. Afr. Pl. Welw. 2: 83 (1899); Wright in Fl. Trop. Afr. 8: 121 (1901); Becc., Borasseae: 47 (1924); Faber in Schimp., Pflanzengeogr. ed. 2, 1: 533 fig. 166 (1935); non Hutchinson in Hutch. & Dalz., Fl. West Trop. Afr. 2: 392 (1936) & Tomlinson, Anat. Mon. II. Palmae: 158 (1961).

Figures 3–5.

H. congensis Kirk kin Salom., Die Palm. Gewachse: 43 (1887); Drude op. cit.: 124 nota; Becc. op. cit.: 49: nomen nudum.

H. doreyi Furtado in Rev. Garcia de Orta 15, 1967: 450, tt. 5 & 6 (1970) syn. nov.

H. thebaica sensu Dalziel in Appendix: 508: (1955) p.p.; Russell in Fl. W. Trop. Afr. 3 (1), ed. 2: 169 (1968) p.p.

WEST AFRICA: Ghana loc. incert. (Colonial & Indian Exhibition of 1886 No. 92 — K, **neotype**); Tema Paradise Beach (Hossain GC 37,578 & GC 38,675); Lower Volta Agbozume District, at Sonuto near Keta Lagoon (Quartey & Ayittey; GC 37,579, & Hossain & Enti GC 38,668).

Several specimens of this species in the Herbaria of Kew, BM & Lisbon have been named by me as *H. doreyi*.

This species seems to have originated in Angola in the region of Quanza and become widely distributed further to the northern regions of Upper and Lower Guinea by the Benguela Ocean currents.

In view of the great many variations noted in the collections made by Dr. M. Hossain of Ghana and his assistants, *H. gosseweileri* Furtado (1970) might, on further studies, prove to be a form of *H. guineensis*.

4. ***Hyphaene macrosperma*** Wendl. in Bot. Zeit. 31: 92 (1881); Drude in Engl. Jahrb. 21: 123 (1895) non in nota; Becc., Borass.: 27 (1924) parte typica; Furtado in Rev. Garcia de Orta 15 (4), 1967: 453 Ic. 4 figs. A & B (1970). **Figure 6.**

H. dahomeensis Becc., Borass.: 48 tt. 18 fig. 7 & 42 figs. 1–4 (1924).

AFRICA BOREO-OCCIDENTALIS: Dahomey (Paisson-Herb. Becc. **holotypus**).

Beccari & Drude identified this with *H. baikieana*.

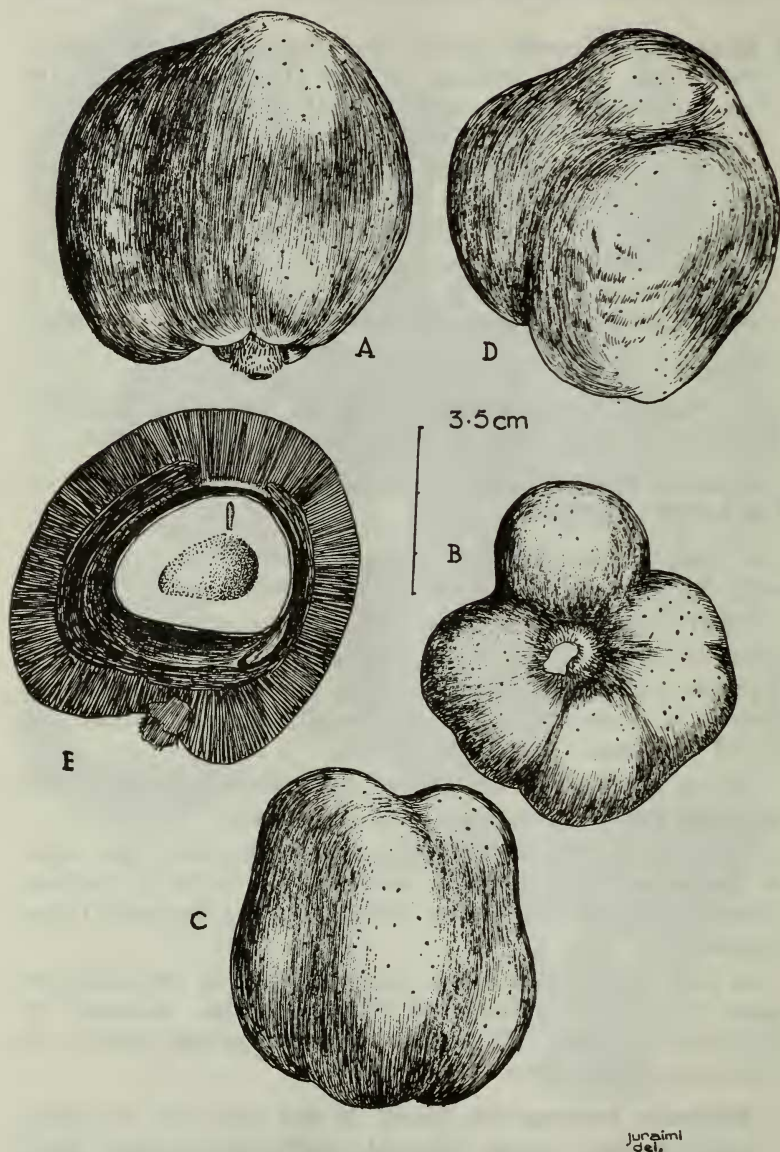


Fig. 10. *Hyphaene thebaica* (Egypt, leg. Walsingham — K).

A: Lateral view of the fruit. B: Fruit as seen from below. C: The dorsal view of the fruit. D: Fruit as seen from the top. E: Vertical section of the fruit.

5. *Hyphaene tuleyana* Furtado spec. nov. Figure 7.

H. thebaicae arcte affinis sed fructibus fere tertia parte minoribus, ambitu laterali quadratis vel obovoideo quadratis, apice curvatis, ventre carinatis, carina etiam apicem versus valde dilatata haec species admodum diversa. Ab *H. occidentali*, quacum propter magnitudinem fructus facile confusa, fructibus conspicue carinatis in sectione transversa ovoideo-trullatis, ambitu laterali obovato quadratis et dorsali rotundato-quadratis haec species sat distincta.

Caulis basi solitarius, circa ad 3 m. altitudinem semel bifurcatus, ramis 7–9 m. longis. *Amenta* duo visa, parte fertili 18–20 cm. longa, 2 cm. in diam., parte basali sterilia, 4–5 cm. longa. *Fructus* circa 5 cm. altus, 6–6.25 cm. latus, 5 cm. in diam., in perimetro stigmatico pedicellari ambitu obovoideo-apice arcuatus, dorso curvatus, supra stigma carinatus, carina valde dilatata, basi inflexa, imo sulcata, utrinsecus paulo depressa, apice altiore quam dorsum vel eo aequa, ambitu dorsali quadrangulato-oblongus, in angulis rotundatus, basin versus paululo dilatatus vel non, medio vel supra cinctulus, apice recurvus; vertice in linea dorso-carinali sulcatus, sulco ante apicem carinae terminato; sectione transversa late ovoideo-trullatus, epidermide non friabili, luteo brunnescente vel cinnamomeo.

AFRICA BOREO-OCCIDENTALIS: Nigeria borealis (Tuley in 1964 — K, **holotypus**).

A very close ally of *H. thebaica*, from which this species is readily distinguished by its much smaller fruits which are obovate-quadrangular on the broadest side with arcuate apex, and almost quadrangular on the dorsal side, sometimes a little broader at the base and often constricted above the middle. The carina is dilated above and its tip is often the highest point in the fruit. The dent at the apex is more towards the carina than in the centre of the vertex which is the case in *H. thebaica*.

The fruit is more or less the size of that of *H. occidentalis* but differing from it in being obovate in the broadest side and having a well-developed carina making the species ovoid-trullate in cross-section.

A photograph taken by Tuley (apparently in 1964) shows that the palm does not divide underground but only when the stem is about 3 metres high. The tree was branched only once.

The specimen and the photographs were apparently made in 1964 and probably Russell (Fl. W. Trop. Afr. 3 (1) ed. 2: 169 (1968)), included also this species under *H. thebaica*.

Tomlinson identified the specimen of *H. togoensis* growing in the Achimota Gardens as *H. guineensis* and referred in the note at the herbarium to the wild North Nigerian species which may be *H. tuleyana*. This may also be partly the species from Bornu in North Nigeria which Drude had referred to as *H. thebaica* (Engl. Jahrb. 21: 110 (1896)).

Hyphaene thebaica (L.) Mart. Figures 8–10.

Since this binomial has often been misapplied to several unrelated species, advantage is taken here to illustrate three of its forms. The species has to be typified on t. 133 of Martius (Palm. 1838–49), while Beccari's t. 20 (Borasseae, 1924) has to be excluded, being apparently a member of the group referred by Beccari as "*Hyphaene multiformis*" (Borasseae: 32 (1924)).

The fruit of *H. thebaica* varies a great deal in size, depending mostly upon ecological conditions. It is always ovate or ovoid in shape, being almost truncate at the base where it is more or less grooved on the sides of the keel. This last is broadly ventricose in the lower half and gradually narrowed towards the obtuse or slightly retuse apex. The dorsal side is arcuate, broad towards the base, slightly narrowed towards the apex.

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